

FIG. 1

16a

# Quadrature Mach-Zehnder Modulation Device

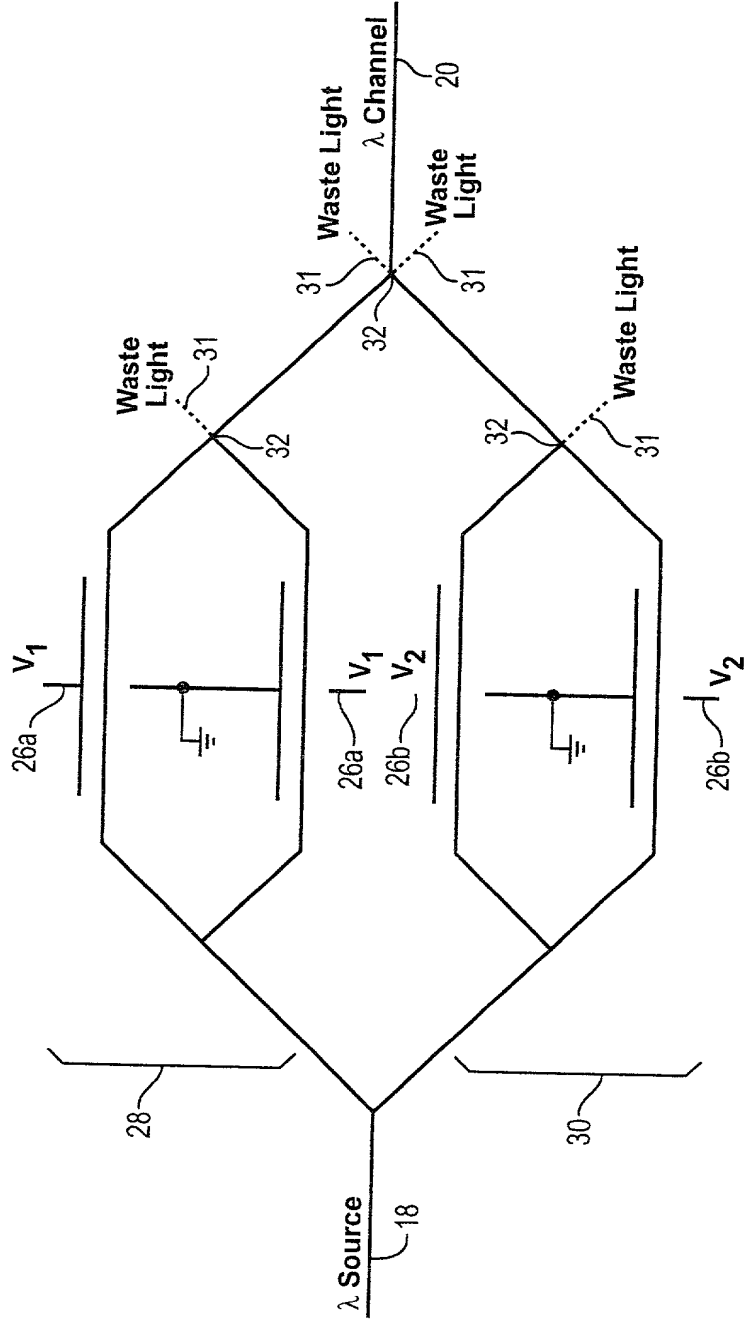


FIG. 2

Mach-Zehnder Device  
Transfer Function

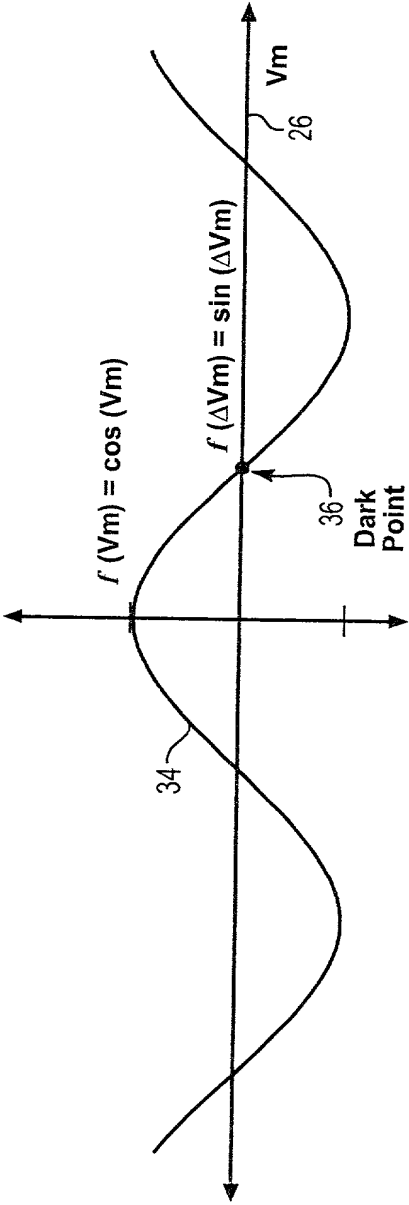


FIG. 3

FIG. 4 is a block diagram of a Modulation Synthesizer 12. The synthesizer includes an Error input 21, a Shift input 24, an integrator 38, a summing junction 42, a Total Shift output 44, and a Waveform Generator 46. The Error input 21 is connected to the integrator 38. The Shift input 24 is connected to the summing junction 42. The output of the integrator 38 is connected to the summing junction 42. The output of the summing junction 42 is the Total Shift output 44, which is connected to the Waveform Generator 46. The Waveform Generator 46 produces the final output 26.

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# Modulation Synthesizer

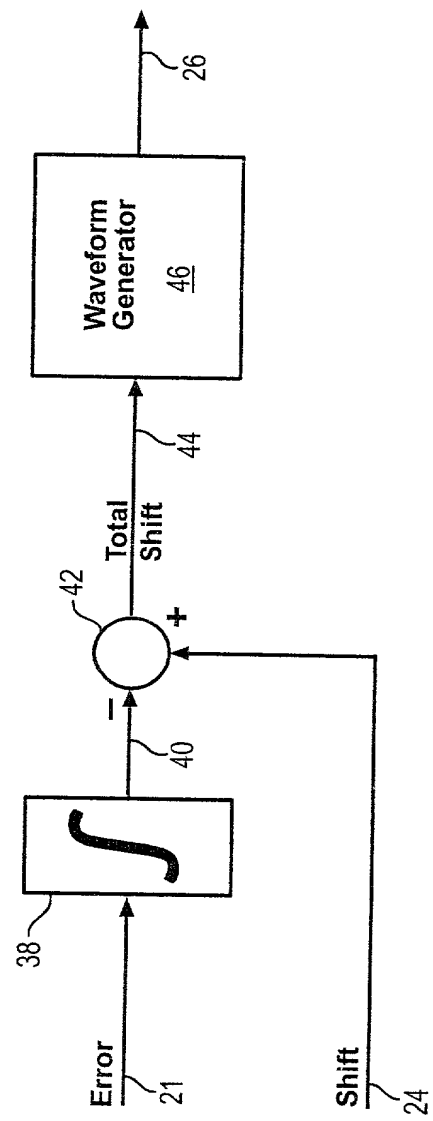


FIG. 4

FIG. 5 is a block diagram of a Quadrature Modulation Synthesizer (With On/Off Data Keying) according to the present invention.

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# Quadrature Modulation Synthesizer (With On/Off Data Keying)

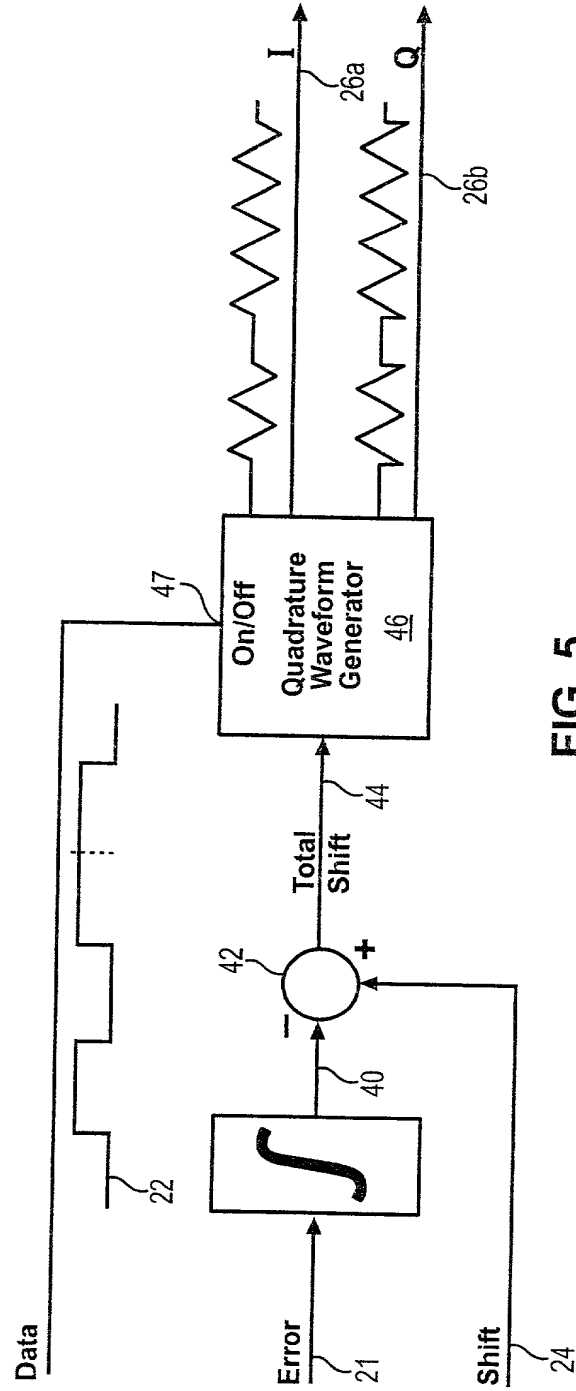


FIG. 5



# Modulation Synthesizer (With Frequency Shift Keying)

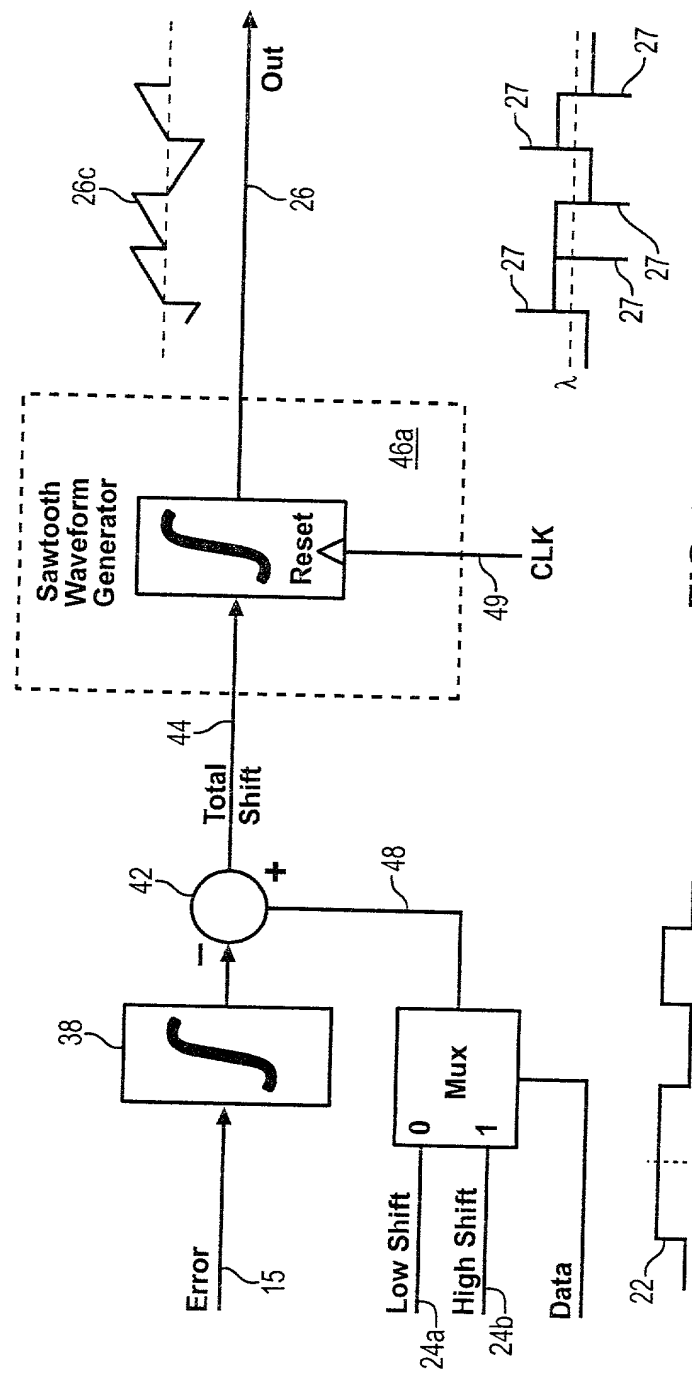


FIG. 7

# Wavelength Error Detector (Fixed Wavelength)

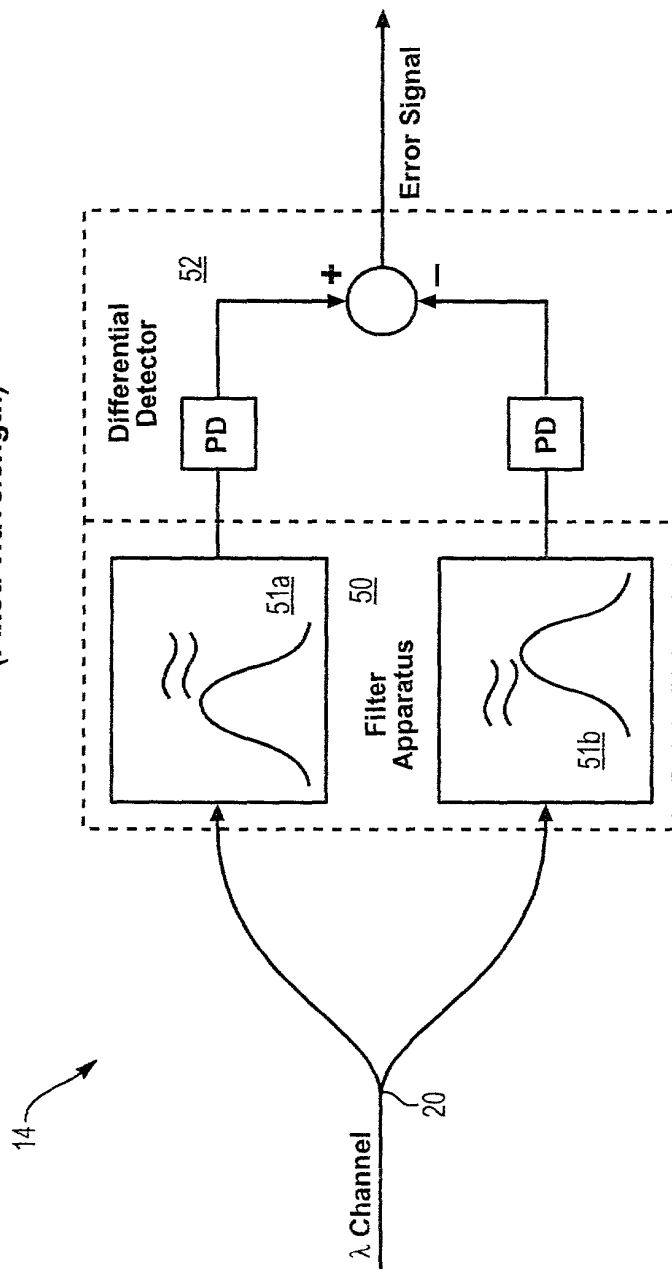


FIG. 8



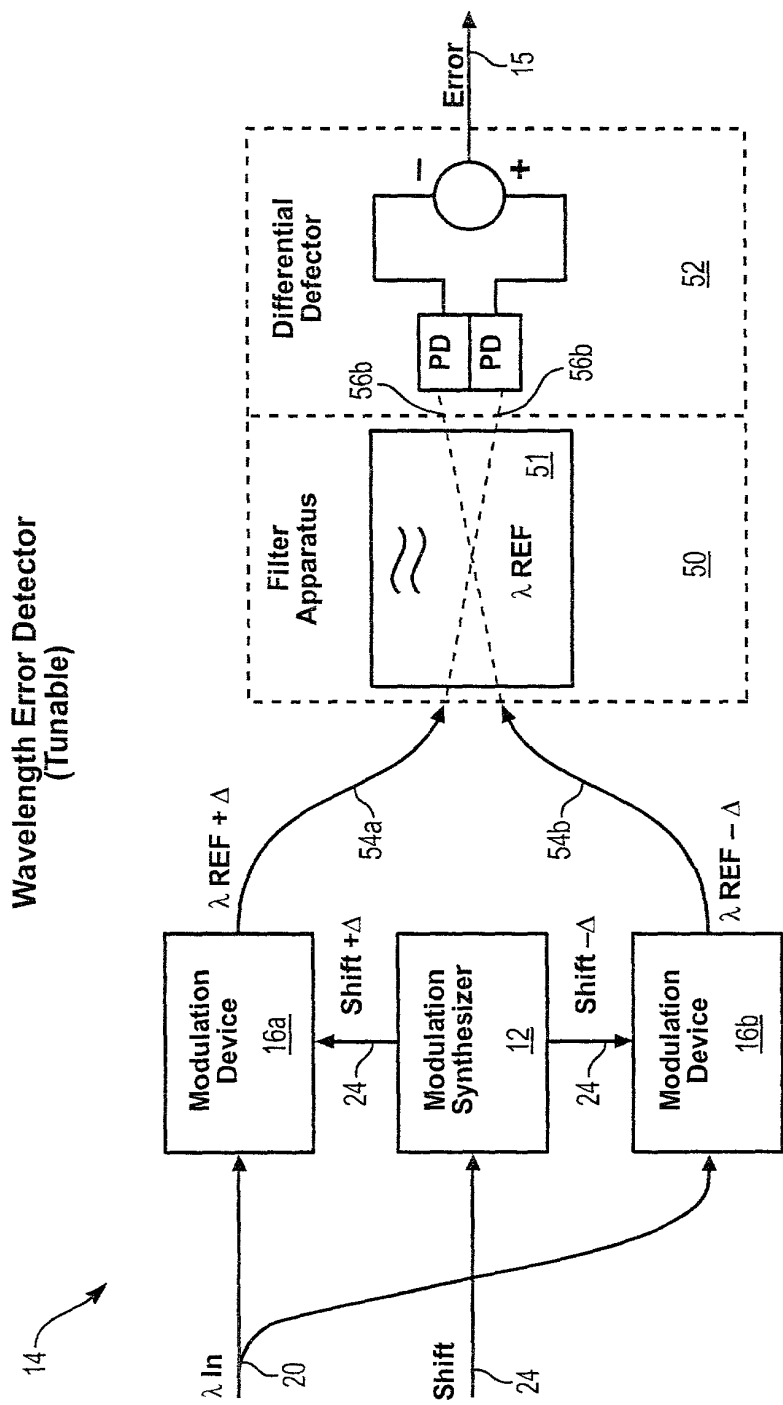


FIG. 9

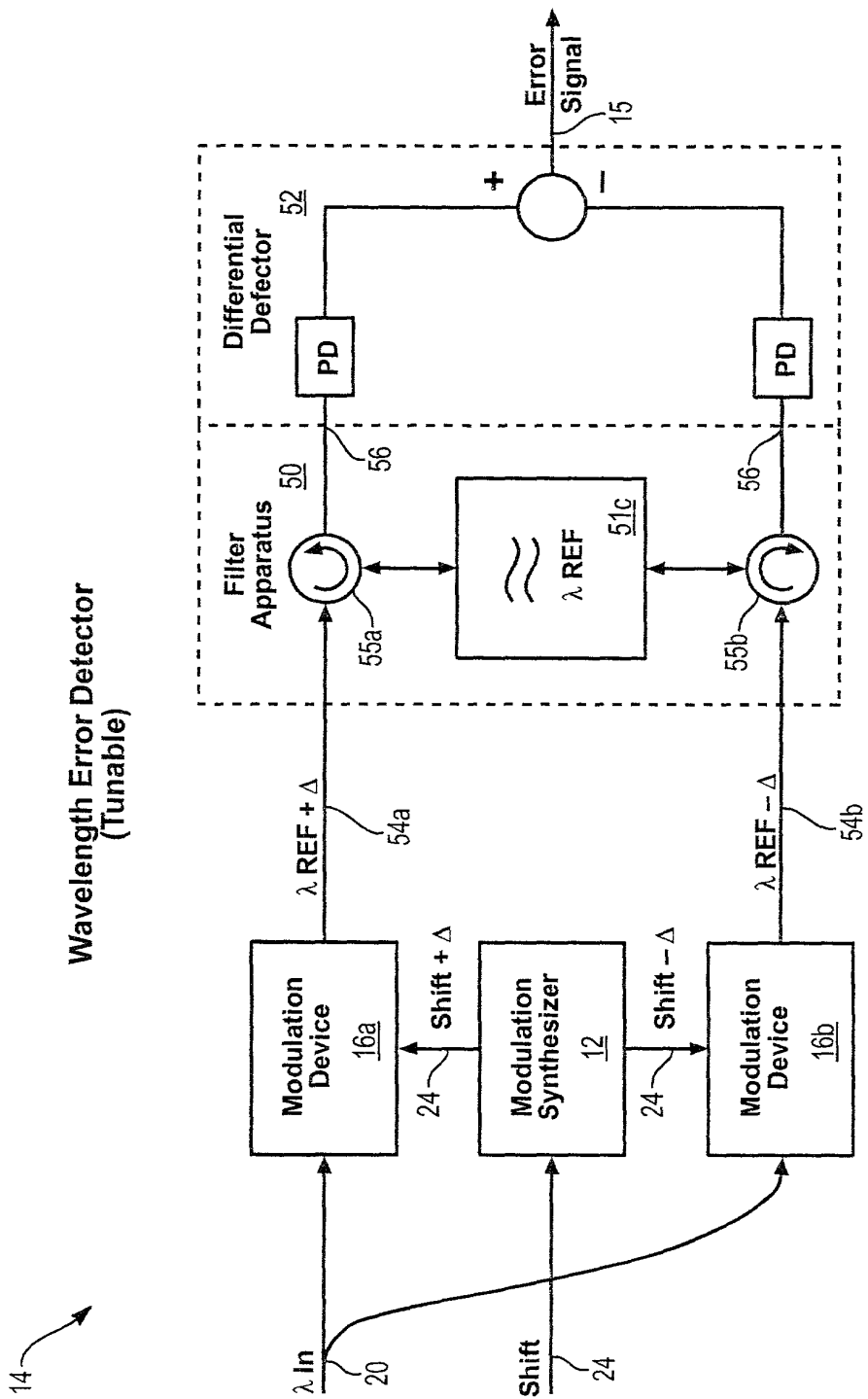
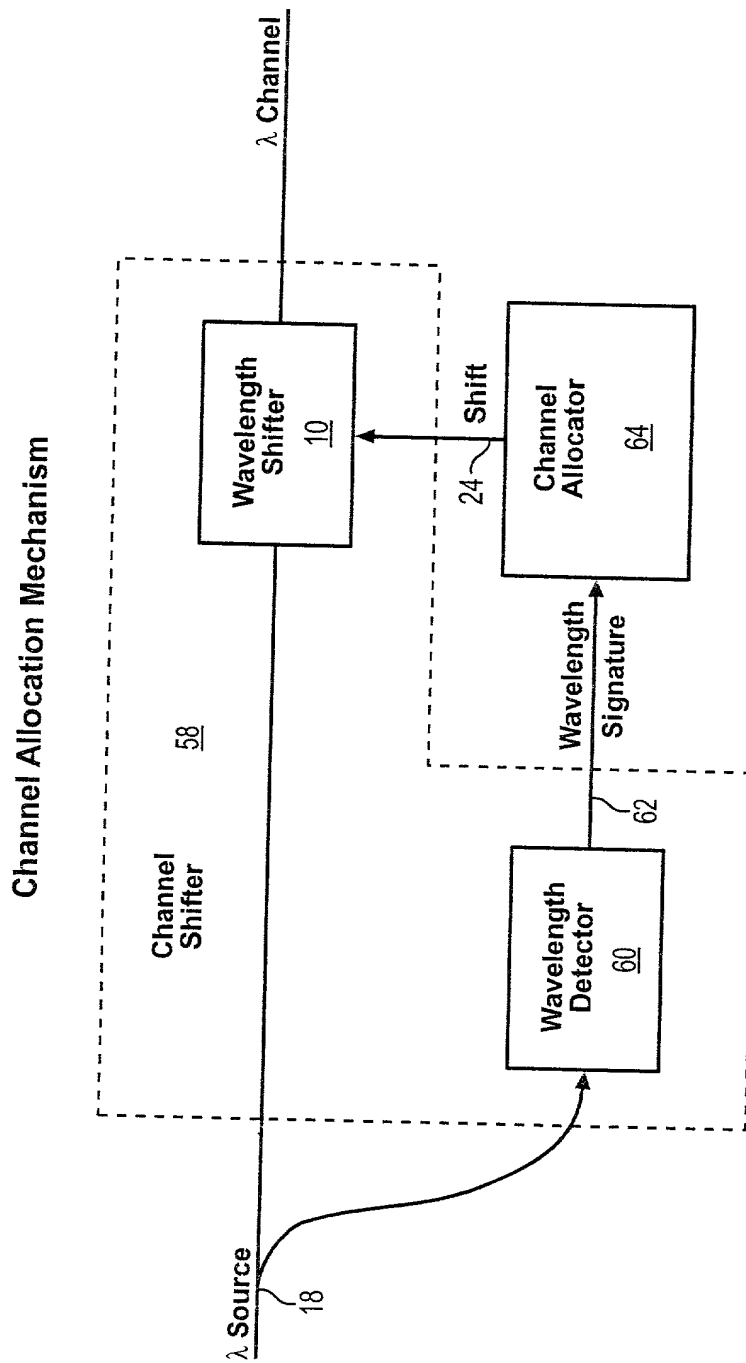


FIG. 10



**FIG. 11**

70 →

# Tunable Wavelength Stabilized Transmitter

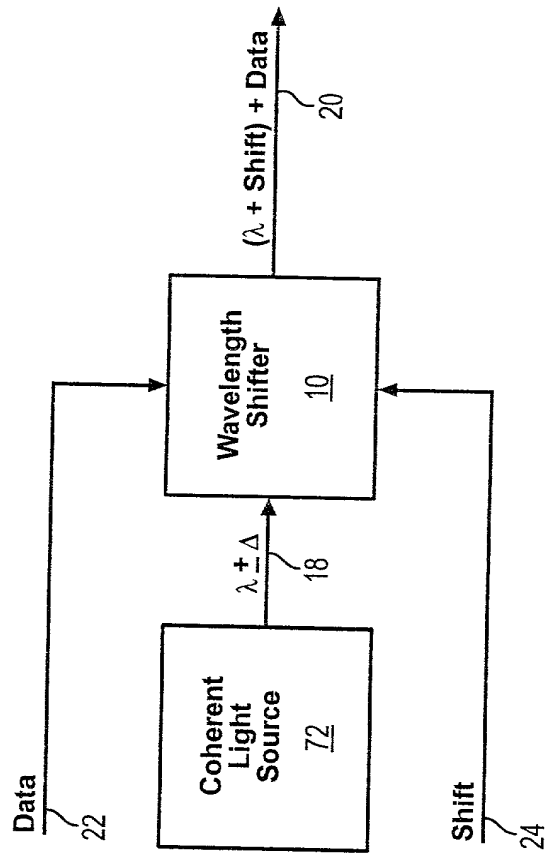


FIG. 12

FIG. 13 is a block diagram of a Recursive Wavelength Shifter 74. The diagram shows an input signal  $\lambda$  In 18 entering an Amplifier 82. The output of the Amplifier 82 is fed into an Output Filter 78, which produces the  $\lambda$  Out 87. A feedback loop is formed by a Wavelength Shifter 10 and a Loop Filter 84. The Wavelength Shifter 10 receives a Shift input 24 and the output of the Loop Filter 84. Its output, labeled  $(\lambda + \text{Shift})$ , is fed back into the Amplifier 82. The entire feedback loop, including the Wavelength Shifter 10 and Loop Filter 84, is enclosed in a dashed box 80. A graph 80 is shown to the right of the dashed box, illustrating the frequency response of the system.

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# Recursive Wavelength Shifter

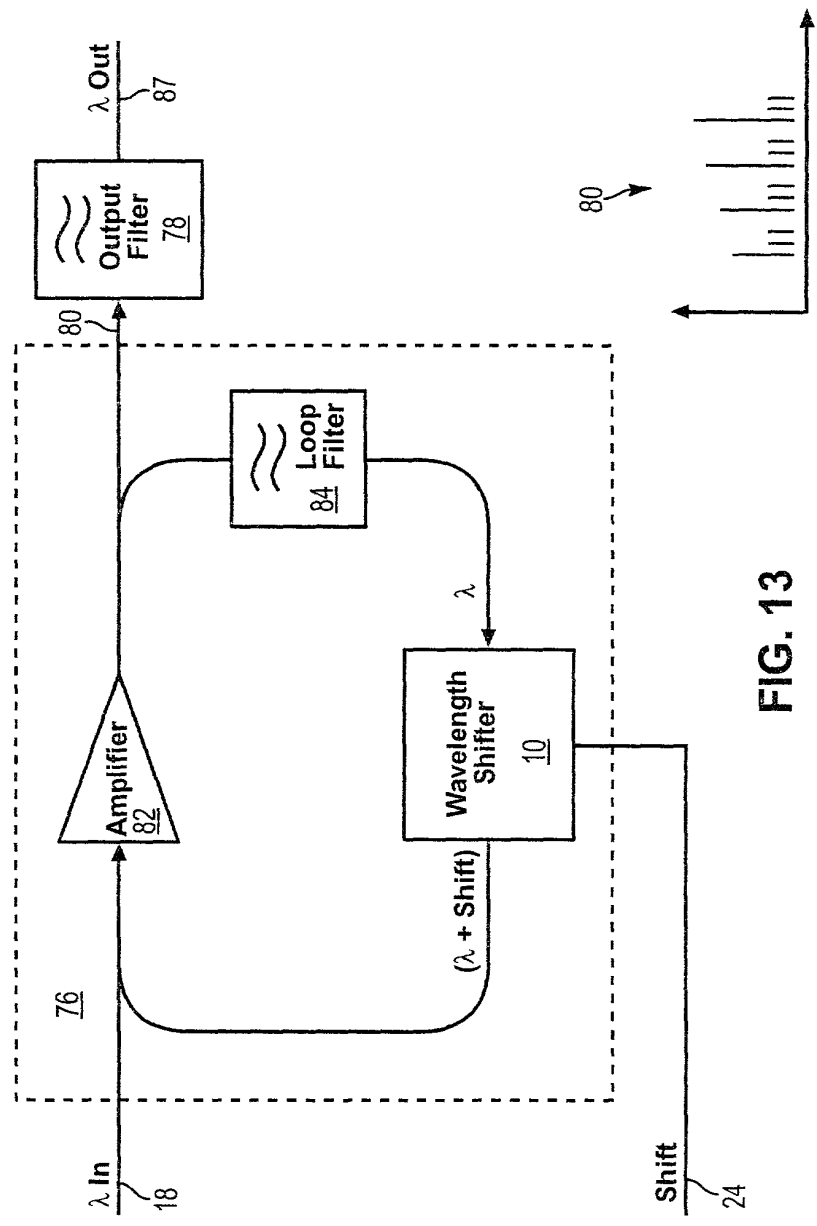


FIG. 13

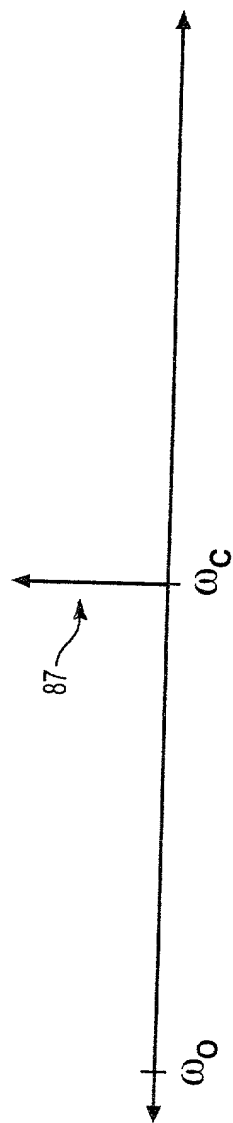
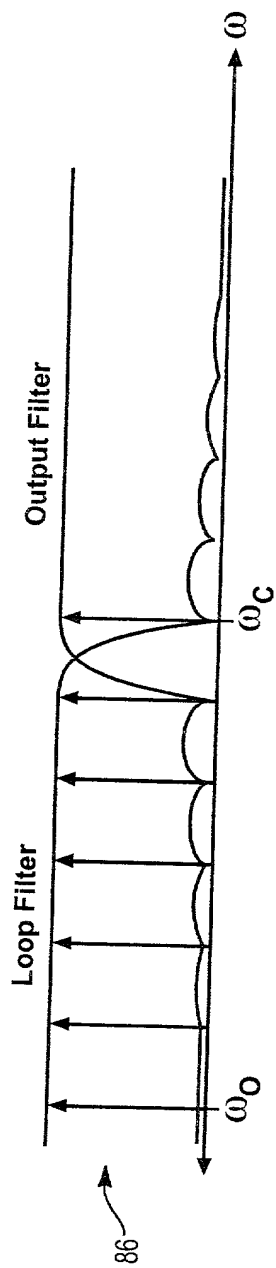


FIG. 14